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(71) Applicant: CAPITOL VIAL, INC. [US/US]; 151 Riverside Drive, Fultonville, NY 12072 (US).

(72) Inventor: HEKAL, Ihab, M.; 121 Blackberry Drive, Stanford, CT 06903 (US).

(74) Agents: REYNOLDS, David, D. et al.; Novak Druce Reynolds Burt, King Street Station, Suite 750, 225 Reinekers Lane, Alexandria, VA 22314 (US).

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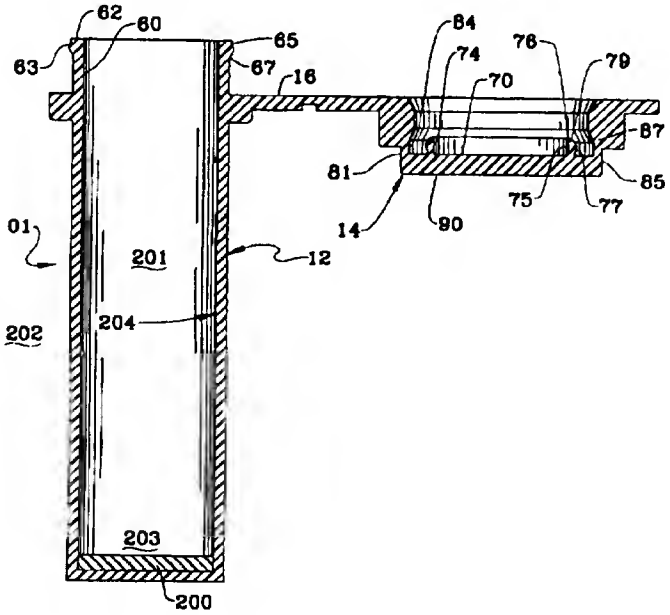

(57) Abstract

Shipping and storage container (01) having a body (12) and a cap (14) that together create an enclosure that is constructed from thermoplastic and that includes at least one insert (200) of high-concentration desiccant integrally molded therewith. The containers may be injection molded about a pre-formed insert is so that the insert is at least partially encased within the body of the container. Alternatively, the insert may be co-molded with the body of the container so that the two components are bonded together into one unitized and continuous body.

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DESICCANT MATERIAL INCLUDED IN A CLOSED CONTAINER

DESCRIPTION

TECHNICAL FIELD: The present invention reletes to containers heving desicceting abilities. More particularly, the present invention reletes to thermoplestic conteiners.

BACKGROUND ART: There are many erticles thet ere preferebly stored end/or shipped in en environment that is as moisture free as possibla. Tharefora, containers having the ability to ebsorb excess moisture have been recognized as desirabla. One application in which moisture ebsorbing conteiners ere desired is for the shipment and storage of medications whose afficacy is compromised by moisture. The initial plecement of medicines into a sealed moisture free container is usuelly controllable. Furthermore, the container for the madicine is selected so that it has a low permeebility to moisture. Therefore, the medicetion will normelly be protected from moisture until it reaches the end user. Once the medicine is received by the consumer, however, the container must be repeatedly opened and closed to eccass the medication. Eech time the conteiner is opened end unseeled, moisture beering eir will most likely be introduced into tha container and sealed tharein upon closure. Unless this moisture is otherwise removed from the etmosphere or head space of the container, it may be detrimentelly absorbed by the medication. For this reason, it is a well known practice to include e desicceting unit togather with the medication in the conteiner.

In other instances, moisture may be releesed from items that have been placed in conteiners for shipping and/or storage. Prime examplas of such itams are food stuffs that release moisture during shipping and storage. In the instance of containers that are sealed and substantielly impermeeble to moisture, the released moisture will remein within the container about the product. If not removed, this releasad moisture mey have ill effects on the very item that releesad the moisture. It hes been found thet e substantial amount of moisture is released from certein food products within the first forty-eight (48) hours aftar menufacture end packaging. This releesed moisture will remein about the product until removed. If the moisture is not removed shortly after its releese, it mey ceuse the food to degrade into a condition thet is not saleable. In these cases, desiccents mey be included together with the conteined items to continuelly absorb the released moisture until the product is unpacked. In this wey, a reletively dry environment is maintainad ebout the stored item.

The need to eliminate moisture from within seeled containers hes been previously recognized. Early attempts to achieve these goals included the provision of desiccent materiels in febric or similar bags that are placed in tha containers, together and commingled with the matter being shipped or stored. A consumer related problam, however, exists when the desiccent is loose and commingled together with consumable items. If not carefully and thoroughly processed upon

unpacking, the desiccant may not be separated from the consumablas and could harm a person if unknowingly ingested.

Another known mode by which a desiccant may be provided within a container includes coating the interior surfaca of the containar vessel with a desiccant bearing material. Still further, it is known to provide desiccating abilities in a container through the use of layered structures in which e desiccant is "sandwiched" betwean moisture permeable material that confines the desiccant. These layered structures often take the form of flaxible sheeting that may be formad into bag type containers into which items requiring a reduced moisture environment are placed.

Several of the known means by which desiccant bearing containers are constructed require multiple steps and result in more complex and layered structures than are desirad. Furthermore, the provision of desiccant capsules together with contained items is not always satisfactory. As previously explained, commingling of desiccent with food itams and medications is undesirable from a consumer stand point in that the desiccant may be inadvertently ingested. Still further, if the desiccant is not integrally constructed with the container, or at least attached thereto, it may be prematurely removed while still needed for continued removal of moisture from within the container. Therefore, a need has been recognized for containers that include a dasiccant as an integral component of the container's body. Regarding the included desiccant of the container, it is desired to enhance its capabilities of moisture absorption with respect to both rate and quantity. Still further, as in all manufacturing processes, it is desired to reduce the required steps for constructing desiccating containers and simplify the resulting structures.

DISCLOSURE OF THE INVENTION: One embodiment of the present invention includes e container having desiccating capabilities. The container includes a container body that forms at least a partial enclosure so that an inside speca and an outside space is created with respect to the container body. There is an insert formad from desiccant entrained thermoplastic that is fixed relative to the container body. At least a portion of the insert is exposed to the inside space of the container body so that it can absorb moisture therefrom. The desiccant entrained thermoplastic from which the insert is constructed has a high desiccant concentration of at least forty percent dasiccant to thermoplastic by weight. The container body is constructed from substantially desiccant-free thermoplastic in ona embodimant end from low desiccant concentrate thermoplastic having at most twenty percent desiccant to thermoplastic by weight in another embodiment. In a preferred embodiment, the container body is constructed from polypropylene. A cap that is sealably angageable with the container body and constructed from polyethylene may optionally be provided. It is contemplated that the insert may be sufficiently encased by the container body so that the insert is only exposed to the inside space of the container and not to the exterior of the container. In one embodiment, the insert is fixed to the container body by a retainer lip 211 formed by the container body about the insart. In another, the insert is fixed to the container body by a shrink-fitting of the container body about the insart. It is contemplated

that the insert and the container body may be co-molded into a unitized body. As an optional enhancamant, the desiccant entrained thermoplastic from which the insert is constructed may include a polar organic compound that enhances tha absorption capabilities of the desiccant. The insert may take the form of a liner that covers at laast a majority of the interior surface area of the container body.

In an alternative embodiment, a container having desiccating capabilities is disclosed. It includes a container body that forms at least a partial enclosure so that an inside space and an outside space is created with respect to the container body. There is an insert constructed from desiccant entrained tharmoplastic that is intagrally joined to the containar body by a co-molding process that forms a single unitized body from the two components. After the co-molding process, at least a portion of the insert is exposad to the inside space of the container body for absorbing moisture therefrom.

A method for co-molding the above container having desiccating capabilities is also disclosed. The steps of the method include injecting a high desiccant concentrate thermoplastic insert into a container mold. A container body is injected about the insert so that a single unitized body is formed from the two components. Whan the container body is formed, the insert is enclosed within the container body so that the insert is only exposed to an inside space of the container. The step of injecting the container body about the insert is performed contemporaneously with the step of injecting the insart so that the insert and the body meld together at an interface thereby forming the unitized body. Alternatively, the injection of the container body about the insert is performad at a tamperature sufficiently elevated so that the insert and the body meld together at an interface theraby forming the unitized body. Before the thermoplastic is injected into the mold, tha various desiccant concentrations are prepared. During the injection process, the high desiccant concentrate thermoplastic is introduced into the mold through a first injection port 209 and the desiccant-free or low concentrate thermoplastic is introduced into the mold through a second injection port 210. In one embodiment, the mold is moved from a first injection station to a second injection station. A preferred means for moving the mold between stations is on a rotating table.

The present invention provides a containar, and process for constructing the same that satisfies the need for more effective desiccating storage and shipping containers. The containers of the present invention provide superior desiccating abilities, while at the same tima permitting efficient construction of a container that has and maintains structural integrity. Furthermore, the present invention provides a means by which the container may be formed having a substantially unitized and continuous body.

BRIEF DESCRIPTION OF DRAWINGS:

Figure 1 is e cross-sectionel view of a desicceting container with an insert in the form of e disk molded therain.

Figura 2 is a cross-sectional view of e desicceting conteiner with an insert in the form of a liner molded therain.

Figure 3 is a partial cross-sectionel view of the container body showing a lip retainer.

Figura 4 is a side view of e mold in pertiel section mounted upon e rotetable table for transport between injection stetions and showing a conteiner and insert molded therein.

Figure 5 is e side view of e mold in pertial section showing a container and insert molded therein in e single station configuration with two injection ports.

Figure 6 is e schemetic of the method by which the container is co-molded.

MODE(S) FOR CARRYING OUT THE INVENTION: In ona embodiment of the present invention, a reletively smell conteiner mey be manufactured similar in construction to the eseptic vial and cep of U.S. Petent 4,783,056 of Robert S. Abrams, the disclosure of which is expressly incorporeted herein by referenca. Therein, the injaction molding of capped sample vials from thermoplastic materiel is disclosed. Like reference numerels ere used in tha present application to those of the 4,783,056 patent to designete similer or like apparatus or process.

The presently disclosed invantion includas and is applicabla to the manufacture of similar containers. The containers 01 disclosed herein, however, are not limited to viels. It is contemplated that containers 01 constructed according to the present invention may be larger or smallar than the vials of 4,783,056 end of variable shape. Furtharmore, the caps 14 may be integrally formed with the bodies 12 of the containers 01, or they may be manufactured as separate units. Still further, the present invention may ba embodied exclusively within the body of e conteiner 12 or a cap 14 for e container 01.

The meteriel used in the construction of these containers 01 typically provides e berrier between the interior 201 and exterior 202 of the container 01 that is substantially moisture impermeeble and most often is a thermoplestic. While it is contamplated that any thermoplestic mey be utilized, polypropylene is preferred for tha construction of the body 12 of the container 01. Polypropylene is desireble beceuse of its durability, rigidity and resistance to breakege after being molded into the form of a container 01. Othar examples of suitable thermoplastics may be selected from the following groups: polyolafin, polyethylena, polycerbonate, polyamide, ethylene-vinyl acetate copolymer, ethylene-methacrylate copolymer, polyvinyl chloride, polystyrene, polyester, polyester emide, polyacrylic aster, end polyvinylidene chloride, acrylic, polyurethene, polyacetal, end polycarbonate. Thase end other thermoplestics may be utilized either singularly, or in combinetions.

The prasent invention includas the manufacture of a container 01 in which the majority of the container's body 12 is constructed from the base thermoplastic, e.g. polypropylene,

beceuse of its durebility end resistence to breakage. To establish and/or increase e desicceting cepacity of the molded conteiner 01, an insert 200 that has bean formed from a desiccant entrained thermoplastic is integrally constructad with tha body 12 of the container 01. The concentration of desiccent entreined within the insert 200 mey exceed seventy-five percent (75%). Typicelly, however, the desiccant concentration in the insert 200 will fell within a range of forty to seventy-five percent (40-75%) desiccant to thermoplastic, by weight. This concentration is considered to be e high concentration for most thermoplastics. The maximum desiccant beerable concantrations will vary among tha various types of thermoplastics due to their differing characteristics. In the instance of polypropylene es the bese meterial, an upper concentration of desiccant will be considered to be ebout sixty percent (60%) by weight. In the instance of polyethylene, however, the meximum concentration of desiccant will be about seventy-five parcent (75%) by weight. As the desiccant concentretions within the thermoplastics increase, the performance of the material degeneretes to unaccaptable levels.

In one embodiment, the insert 200 is loceted in the base or bottom 203 of the container body 12 end is exposed to the interior space 201 of the container 01. The configuration of this embodiment is similar to a sample vial. Because the durability and resistance to breekage is lessened in the higher renges of desiccant content, it is advantagaous to heve the polypropylene used in the construction of the container's body 12 formed about the insert 200 except for at those surfaces to be exposed to the interior 201 of the container 01. A container 01 of this configuration provides desired structural integrity while also providing the greater desiccating ability of the high desiccant laden insert 200 that is directly exposed to the interior 201 of the container 01. It is also contemplated that the insert 200 may be included in the construction of the container's cap 14. In this case, tha insert will be integrelly formed with the cap 14 so that an exterior surface of the insert 200 is exposed to the interior 201 of the container 01 when instelled thereupon.

As e further alternative embodiment, the insert 200 mey be less localized, and extended to a greater degree about a greater portion of the interior surfece 204 of the container body 12. In this instence, the high desiccent beering thermoplastic forms more of e liner 205 at the interior surface 204 of the conteiner 01. To provide meximum desiccating abilities, the liner 205 mey completely cover the interior surface 204 of the container 01; this mey optionally include the interiorly exposed surfeces of a cep 14 of e closed conteiner 01.

One contemplated method for the manufacture of the conteiner 01 includes the provision of a preformed insert 200 about which tha tharmoplastic of tha remainder of the body 12 of the conteiner 01 is injection moldad. In this process, it is important thet the insert 200 be affixed to

or within the body 12 of the conteiner 01. This may be achieved merely by molding the body 12 ebout the insert 200 so that the two components ere mechenicelly connected one to the other. The mechenicel connection may teke the form of a retaining lip 206 formed by the container body 12 ebout the insert 200 that effectively fixes the insert 200 with respect to the rest of the body 01.

Alternetively, it is elso contempleted that a "shrink-fit" mey be achieved by the body 12 forming thermoplestic ebout the insert 200. A perticuler exemple of this shrink-fit epplicetion would be the provision of e desiccent loeded insert 200 constructed from e bese thermoplestic of polyethylene end a conteiner body 12 molded thereabout from e base thermoplastic of polypropylene. Upon cooling after being injection molded, polyethylene shrinks less then polypropylene under similar circumstences. Therefore, if e polypropylene body is injection molded about a polyethylene insert 200 thet has been either previously formed, or is injection molded contemporaneously with the container body 12, the polypropylene container body 12 will shrink ebout the polyethylene insert 200. This shrink-fit method may be implemented whether or not the insert 200 is reletively smell and localized with respect to the container body 12 or whether the insert 200 tekes the form of a previously described liner 205 configuration. In either case, the exteriorly formed conteiner body 12 may shrink about the insert 200 if the thermoplastics from which the insert 200 end conteiner body 12 are eppropriately selected. The use of the retaining lip 206 end shrink-fit method of affixing the insert 200 or liner 205 to the conteiner body 12 is used primerily when the materials of construction of the insert 200 end container body 12 are not compatible. The two components will be considered incompatible if they do not automatically adhere one to the other es a result of the manufacturing process.

Alternetively, the insert 200 will be constructed from a material that bonds to the body 12 of the conteiner 01 when the body 12 is placed thereebout. Therefore, a preferred method for constructing the insert 200 beering conteiner 01 of the present invention is co-molding. That is, the primery body 12 of the container 01 is molded, while the high desiccent insert 200 is also molded. The two portions are said to be co-molded because they are either simulteneously or sequentially injection molded in a single process. The process of co-molding results in the construction of a unitized container body 12 in which the insert 200 is seemlessly combined with the body 12. In most instances, the insert 200 and conteiner body 12 adhere one to the other es e result of e melding together of the base thermoplastics from which each is constructed at an interfece therebetween. The melding action takes plece when the insert 200 end conteiner body 12 are eech injected into the mold 10 sufficiently closely with respect to time so that each is in at leest a semi-molten stete while in contect one with the other. Alternetively, heat from the thermoplestic of a body 12 injected ebout an insert 200 may cause the contacted portions of the insert 200 to melt slightly end meld with the thermoplastic of the body 12 adjacent thereto. In each case, there will be a phese between the high desiccant concentrete insert 200 and container

body 12 in which the two construction meterials blend to some degree creating a seamless interface and therefore unitized conteiner 01 out of the two components.

As explained, in a preferred embodiment, the high-desiccant insert 200 is located in the base or bottom 203 of the conteiner 01. A surfece of the insert 200 mey be directly exposed to the interior 201 of the conteiner 01, or the insert 200 mey be fully encepsuleted by the primery body 12. Still further, it is contemplated that the bottom 203 portion of the container 01 may be constructed exclusively from the high-desiccent thermoplestic if the material's reduced qualities do not adversely affect the performance of the container 01. This mey be the case if the container 01 is not going to be exposed to high stresses or rough hendling. To produce such a container 01, it is contemplated that the lower portion and upper portion will be formed from thermoplastic of differing desiccant concentration, that is, thermoplastic of lesser desiccant concentration will be injected into the upper portion of the mold 10 and higher desiccant concentration will be injected into the lower portion. The thermoplastic of the two portions will commingle at an interface end meld together into a unitized container body 12, provided that the base thermoplastics of each are competible. Like the other injection processes, it is contemplated thet each portion may be injected from seperete injection ports 209 and 210 or the same port. As a result, the portions may be injected either sequentially or contemporeneously. In eech case, the proportion of the container body 12 formed by eech portion will be controlled by the amount of thermoplestic injected into each.

In eny event, the thermoplastic in which the desiccant is entrained is moisture permeable to the degree that moisture from the interior 201 of the conteiner 01 may be transferred to and stored in the desiccent. It is possible that the thermoplastic from which the insert 200 is menufactured may heve a higher moisture permeability than that from which the remainder of the body 12 of the conteiner 01 is constructed. In this case, the insert 200 may be enclosed within the conteiner 01 by a lower moisture permeable thermoplestic of the container's body 12. In this wey, moisture will not reedily be transferred from outside the container 01 to the interior. In view of the possibility of desiring differing moisture permeabilities in the insert 200 and the container body 12, it is contemplated thet the two components 200,12 may be constructed from different materiels that ere potentielly incompetible.

The process of the present invention in which the insert 200 is co-molded within the primary body 12 of the conteiner 01 may vary. In e first embodiment of the molding process, it is contemplated that the mold 10 will move between two injection stations. An injection assembly that is generally designeted by reference numerel 96 may be installed and withdrawn from the mold frame 24. At one station, typicelly the first stetion, the insert 200 will be injection molded. In order to mold the insert 200, a ring sheped barrier will be provided that hes e circumference substantially matching the perimeter of e lower end of core 48. It is desired thet the thickness of the insert 200 be approximately one-eighth of en inch, therefore the thickness or height of the barrier ring will likewise be one-eighth of an inch. As the injection assembly 96 is installed within

the mold freme 24, the berrier ring is the leading component. The ring contacts the lower surfece of the core 48 forming a berrier within which thermoplestic mey be injected. High concentrete desiccent thermoplestic is then injected into the interior of the ring thereby forming the insert 200. The high concentrete desiccent thermoplestic of the insert 200 mey be injected at a tempereture thet is less then the tempereture et which the thermoplestic of the conteiner body 12 is injected. The lowered tempereture mey be required so thet the desiccent contained therein does not degrade. The necessity of the lowered tempereture mey be obvieted by using different end/or high-grede desiccents thet are not susceptible to degredetion within the normal temperature renges of the injection process.

When the insert 200 hes sufficiently cooled to e point that it will maintein its shepe after the removel of the berrier ring, the injection essembly 96 is withdrewn from the mold freme 24, together with the berrier ring thet is etteched thereto. The insert 200 edheres to the lower surfece of the core 48 end remeins within the mold 10.

The mold 10 is then moved to a second injection stetion similer to that previously described, but configured so thet the desiccant-free thermoplestic is injected into the cevity 114 thereby forming the body of the conteiner 12. The meens for conveying the mold frame 24 between stetions is preferred to be e rotetable teble 207 that operetes continuously between the two stations. During this second injection, thermoplastic is injected to form the body 12 of the conteiner 01 end optionelly the cep 14. During this same step, thermoplestic is elso injected about the insert 200 that hes been previously formed. In this wey, those portions of the insert 200 that would heve been exposed to the exterior 202 of the conteiner 01 are covered by the desiccent-free thermoplastic.

The top surface of the insert 200 is not covered by the desiccent-free thermoplastic beceuse it remeins in contact with the lower surfece of the core 48. Though the insert 200 is allowed to sufficiently cool to meintein its form between station one and two end during the second injection, the second injection of thermoplestic is mede et e tempereture sufficient to ceuse the two components 200,12 to bond together es described herein. Depending upon the conditions, it is possible that the high concentrate insert 200 will melt enough so that it bleeds into the body 12 of the container 01 loceted edjecent thereto. The emount of bleed, however, is not significent end does not degrede the performance of the exterior thermoplastic that gives the conteiner 12 its strength end durebility.

In en elternetive embodiment of the molding process, only one injection station is utilized, but two injection ports 209 end 210 are provided thereto. The high concentrate desiccent thermoplestic thet forms the insert 200 is injected through one of the ports 209, while the desiccent-free thermoplestic that forms the body 12 of the container 01 is injected through the other of the ports 210. In this process, the core 48 must move longitudinelly eway from the injection essembly 96 a distence equel to the thickness of the insert 200 that is to be formed.

Like the two stetion process, the insert 200 is first formed, and the body 12 of the container 01 is formed thereebout. In most other respects, the two processes are similar.

It is enticipeted that the rete of ebsorption into tha insert 200 may be controlled by the amount of surface aree of the insert 200 exposed to the conteiner's 01 intarior 201. If graater absorption retes are desired, more surfece eree of the insert 200 mey be exposed. If it is dasired that a more prolonged ebsorption process be echieved, then less surface area will be exposed. It is furthar contampleted that the rate of ebsorption by the insert 200 may be controlled by ancapsulation of the insart 200. If slower rates of absorption ere desired, then the insert 200 can be encesad to greater dagreas by the thermoplastic that forms the body 12 of the container 01 end which is lass permaable to moisture. The rete of ebsorption may elso be controlled by using different types of thermoplastics having diffarant moisture permeability rates. Still further, the rate of moistura absorption by the insert 200 may ba affactad by other add-mixtures to the thermoplastic. In particular, it has bean found that tha addition of polar organic compounds, such as "starch", to the desiccant loaded thermoplastic will greatly increase tha rate of absorption. The addition of polyvinyl alcohol (PVOH) hes similar boosting effacts upon the absorption rate of the desiccant loaded thermoplestic. In one particular example, the addition of five percent (5%) starch by waight to polypropylene bearing ten percent (10%) desiccant by waight absorbed moisture at twice the rate of polypropylane bearing twenty percent (20%) dasiccant and no starch.

The amount of moisture that can be absorbed by the insert 200 may be controlled in sevaral ways. It is contemplated that the amount of moistura absorbabla by the insert 200 may be effected by changing the concentration of dasiccant within ecceptable ranges; the greater the concentration, the greater the amount of moisture that can be captured.

In en alternative embodiment, the thermoplastic from which the body 12 is constructed may also have desiccant entrained end suspended therein, but in lesser concentrations than the insert 200. It has bean found that tha concentration of desiccant in the thermoplastic affects the performance cherecteristics of tha molded container 01. As an axample, it has been found that while the plastic will carry relatively high percantagas of desiccant, desirable characteristics such as durebility end resistenca to braekaga may dagrada et higher dasiccant concentrations. It has also been found thet the plestic mey be combinad with lower concentrations of desiccant without eppreciably degreding the performance of tha thermoplastic matarial in its molded and solid state. In e typical application, a reletively low concentration will fall within the ranga of five to fifteen percent (5 - 15%) desiccent by weight to thermoplastic, with a praferred concentration being approximately seven end one-half percent (7.5%). Additionelly, for the purposes of the disclosure made herein, desiccant-free thermoplestic mey also be considered low concentration thermoplastic.

Various concentrations of desiccant beering thermoplastic are commercielly available in pallat form. Custom concentrations may be echiaved by dry blending higher concentration desiccant pellets with lower concentration or desiccant-free pellets of thermoplastic. When

blended in appropriate proportions, any desiccant concentration less then that of the high concentration desiccent pellets mey be accomplished. After the dry blending process, the resulting mixture of pellets mey be injection molded in a typicel manner.

In e preferred embodiment of the present invention, it is contemplated that the source thermoplastic for the insert 200 end that of the conteiner body 12 mey be custom blended to echieve the desired respective desiccant concentrations for eech. For the injection molding process, two supply hoppers would be provided; one having the high-desiccant thermoplestic from which the insert is formed end the other heving a mixture of pellets of differing concentrations that when melted into solution produce the lower-desiccent thermoplastic from which the body 12 of the container 01 is formed. The insert 200 end conteiner body 12 are then injection molded eccording to the various methods described herein.

Although certain embodiments of the invention are illustrated and described herein, it will be eppreciated that many modifications and varietions of the present invention are possible in light of the ebove teechings and within the purview of the appended claims without deperting from the spirit end intended scope of the invention.

WHAT IS CLAIMED IS:

1. A containar having dasiccating capabilitias, said conteiner comprising:

e conteiner body forming at laast a partial enclosure so that an inside space end an outside speca is created with respect to said containar body;

e cep installebla upon said container body for closing said containar body;

en insert formed from desiccant entrainad thermoplastic being fixad relative to said conteiner body; end

at leest e portion of seid insert being exposed to the inside spaca of said container body for absorbing moistura therefrom.

2. Tha container having desiccating capebilitias es recited in cleim 1, wharein said dasiccant antrainad tharmoplastic from which said insert is constructed is of e high desiccant concentration having at laast forty percant desiccant to tharmoplestic by waight.

3. Tha container heving desiccating capabilities as recited in claim 1, wherein said container body is constructad from substantially dasiccant-frae thermoplastic.

4. The conteinar having desiccating capabilities as recited in cleim 1, wherein said container body is constructad from polypropylene.

5. The conteiner having desicceting capabilities as recitad in claim 1, wherein said container body is constructed from low desiccant concentretion tharmoplastic having at most twenty parcent desiccent to thermoplestic by weight.

6. The containar having dasicceting capebilities es recited in cleim 1, further comprising a cap sealably engagaable with said container body end constructed from polyathylane.

7. Tha container having dasiccating capabilitias as recited in cleim 1, wherain said insert is sufficiently encasad by said container body so that said insert is only exposed to the inside space of the container.

8. The conteiner having dasiccating capabilities as recitad in claim 1, wherein said insert is fixed to said conteiner body by a ratainer lip formed by said container body about said insert.

9. The container having desiccating capabilitias as recitad in claim 1, wharein said insert is fixed to said conteiner body by e shrink-fit of said container body about said insert.

10. The conteiner having desiccating capabilities as recited in claim 1, wherein seid insert and said container body ere co-moldad into a unitized body.

11. The containar having desiccating capabilities as recited in claim 1, wherein said desiccant entreined thermoplastic from which said insart is constructed further comprises a polar organic compound that enhances the absorption capabilities of said desiccant.

12. The container having desiccating capabilities as recited in claim 1, wherein said insert forms a liner that covers at least a majority of interior surfece area of the container body.

13. A container having desiccating capabilities, said conteiner comprising:

a container body forming at leest e partiel enclosure so that en inside spaca and an outside space is creeted with respect to seid conteiner body;

a cap installable upon seid conteinar body for closing said container body;

en insert constructed from desiccant entrained thermoplastic integrally joined to seid container body by co-molding thereby forming e single unitized body; and

at least a portion of said insert being exposed to the inside space of said container body for ebsorbing moisture therefrom.

14. A method for co-molding a container having dasiccating capabilitias comprising the following steps:

injecting a high desiccant concentrate thermoplastic insert into a container mold;

injecting a container body about said insart so that a single unitized body is formed; end

enclosing said insert within said container body so thet said insert is only exposed to an inside space of said conteiner.

15. The method for co-molding a conteinar having desiccating capabilities as recited in claim 14, wherein said step of injacting said container body ebout said insert is performed contemporaneously with said step of injecting said insert so that seid insert and said body meld together at an interfece theraby forming seid unitized body.

16. The method for co-molding a conteiner having dasiccating capabilities as recited in cleim 14, wherein said step of injecting seid container body about said insart is performed at a temperature sufficiently elevated so that seid insert and said body meld together at an interface thereby forming seid unitized body.

17. The method for co-molding a container having desiccating capabilities as recited in claim 14, further comprising:

preparing high desiccant concentrate thermoplastic for injection into said mold for forming said insert;

preparing desiccant-free thermoplastic for injection into said mold for forming said container body;

injecting said high desiccant concentrate thermoplastic into said mold through a first injection port; and

injecting said desiccant-free thermoplastic into said mold through a second injection port.

18. The method for co-molding a container having desiccating capabilities as recited in claim 14, further comprising:

preparing high desiccant concentrate thermoplastic for injection into said mold for forming said insert;

preparing desiccant-free thermoplastic for injection into said mold for forming said container body;

injecting said high desiccant concentrate thermoplastic into said mold through a first injection port;

moving said mold from a first injection station to a second injection station; and

injecting said desiccant-free thermoplastic into said mold through a second injection port.

19. The method for co-molding a container having desiccating capabilities as recited in claim 18, wherein said step of moving said mold from a first injection station to a second injection station is accomplished by rotating a table upon which said mold is mounted.

20. The method for co-molding a container having desiccating capabilities as recited in claim 14, further comprising:

preparing high desiccant concentrate thermoplastic for injection into said mold for forming said insert;

preparing low desiccant concentrate thermoplastic for injection into said mold for forming said container body;

injecting said high desiccant concentrate thermoplastic into said mold through a first injection port; and

injecting said low desiccant concentrate thermoplastic into said mold through a second injection port.

FIG. 1

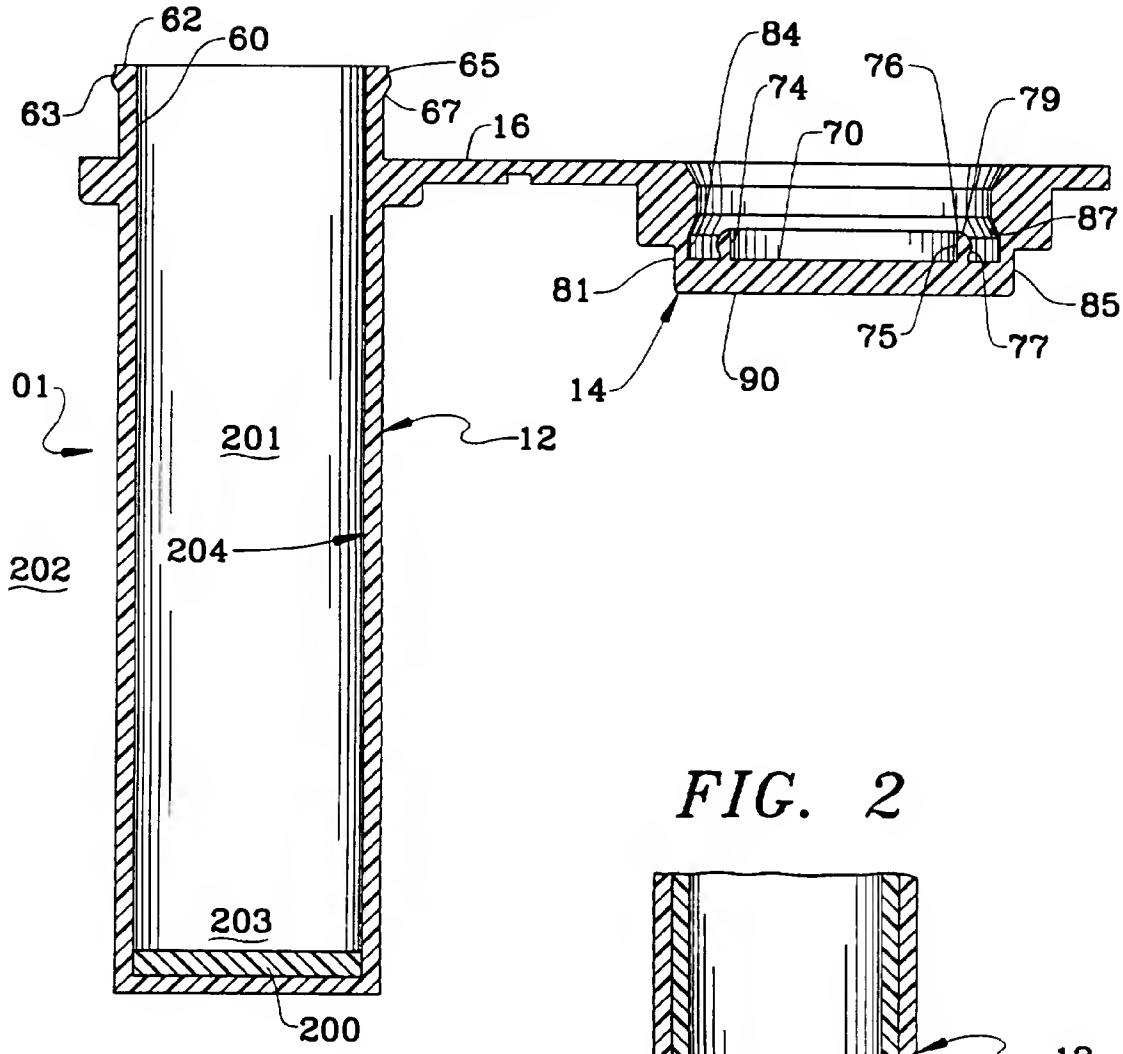

FIG. 2

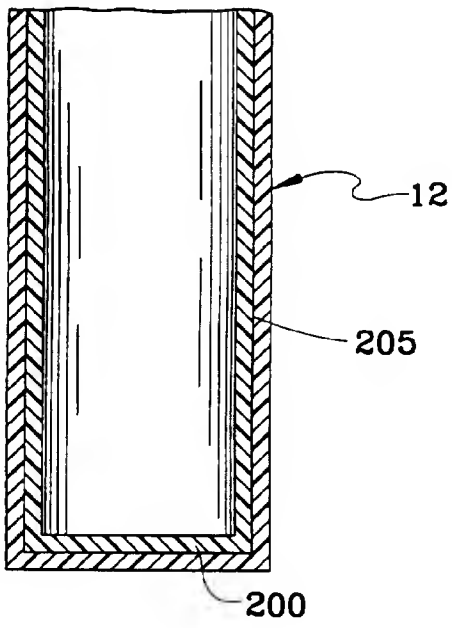

FIG. 3

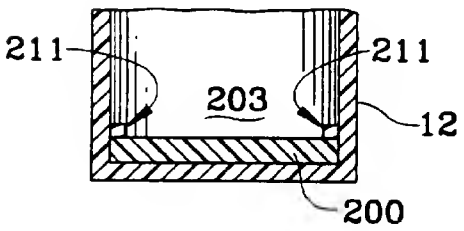

FIG. 4

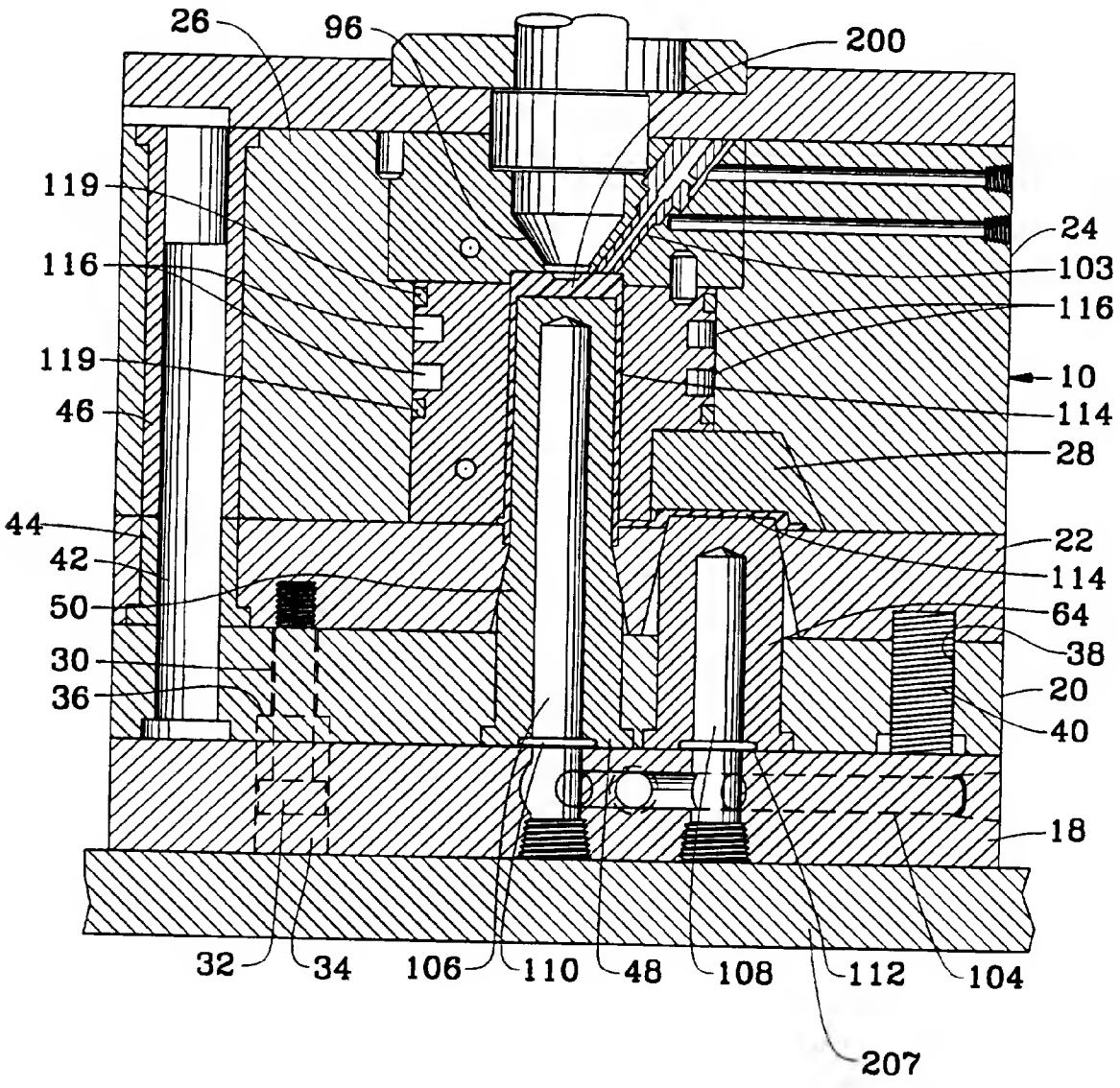
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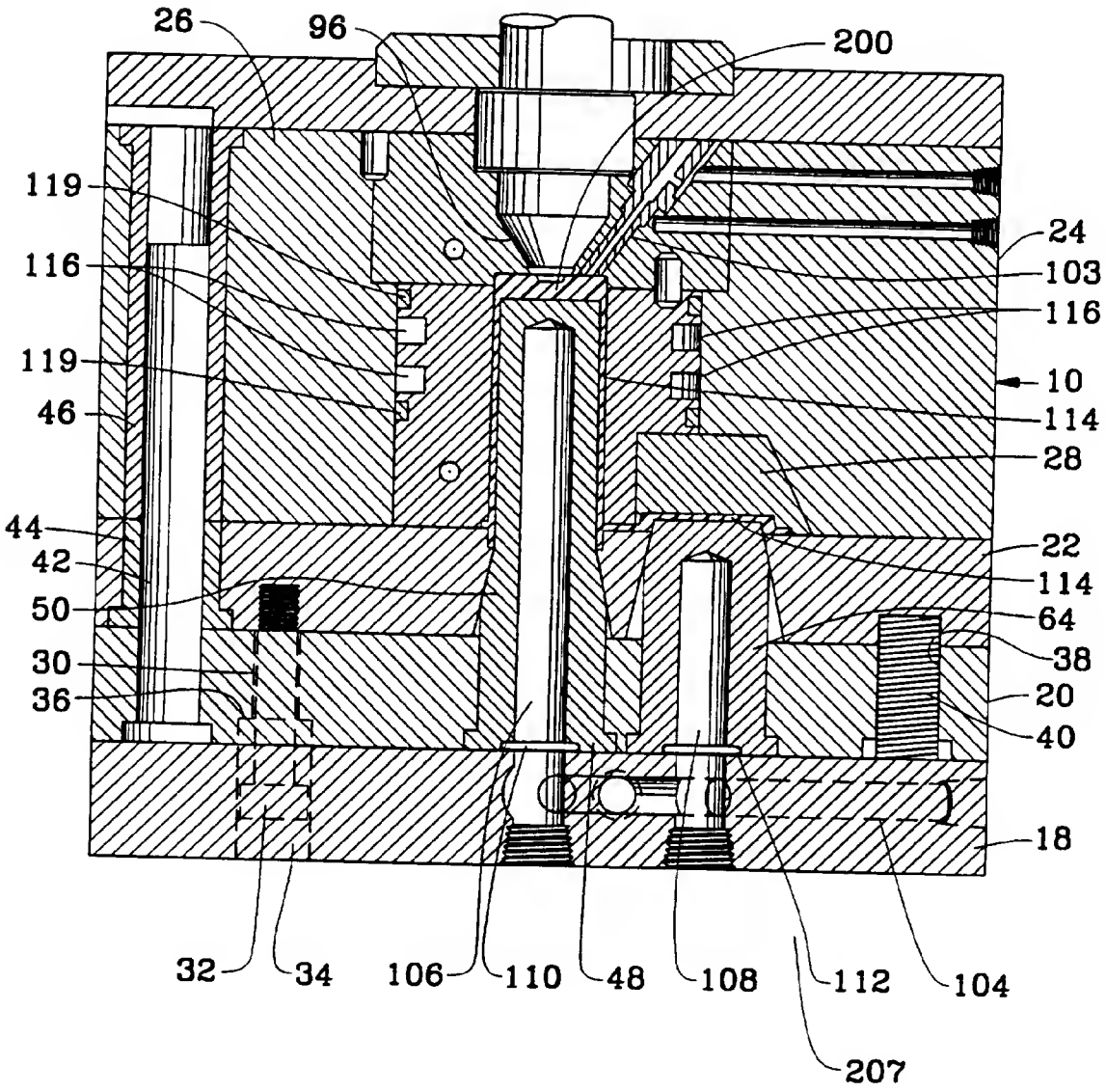
FIG. 5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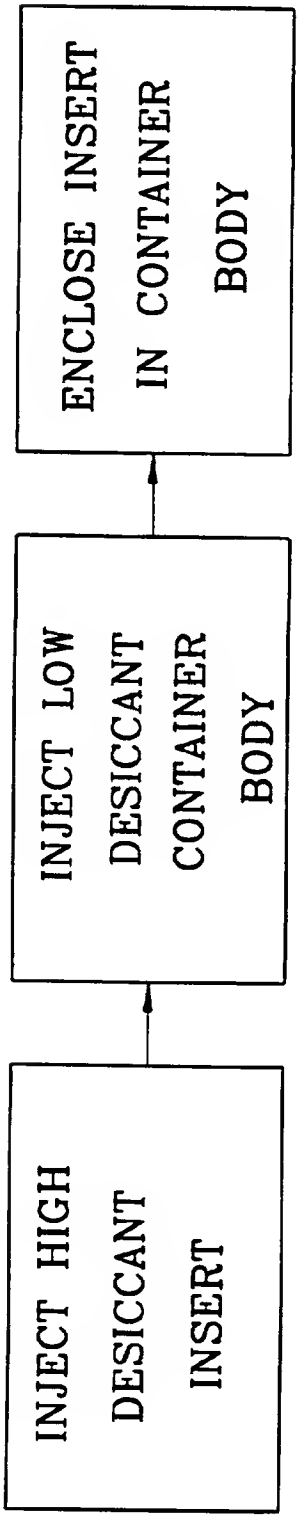
INJECT HIGH DESICCANT INSERT
INJECT LOW DESICCANT CONTAINER BODY
ENCLOSE INSERT IN CONTAINER BODY

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/05261

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B65D 81/26; B29C 45/00, 45/13, 45/14
US CL :206/204; 264/328.1, 328.8, 328.11

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 206/204; 264/328.1, 328.8, 328.11

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	DE, A, 4,013,799 (KNEER), 31 October 1991, see Figure 1 and the abstract.	1, 3, 7, 8, and 12 --- 2, 4, 6, 9, 10, and 13
A	US, A, 3,826,358 (BUTLER ET AL.) 30 July 1974	NONE
A	US, A, 3,833,406 (WHITE) 03 September 1974	NONE
A	US, A, 4,717,324 (SCHAD ET AL.) 05 January 1988	NONE
A	US, A, 4,783,056 (ABRAMS) 08 November 1988	NONE
A	US, A, 4,919,984 (MARUHASHI) 24 April 1990	NONE

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 03 JULY 1996	Date of mailing of the international search report 25 JUL 1996
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-03230	Authorized officer for STEPHEN P. GARBE Sheila Veney Paralegal Specialist Group 3200 Telephone No. (703) 308-01207

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